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SOVIET MACHINE BUILDING

No. 19

SELECTED TRANSLATIONS

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Introduction

This is a serial publication containing selected translations on the machine building industry in the Soviet Union. This report consists of translations on subjects listed in the table of contents below.

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1. Automatic Lines 1L66, 1L67, 1L67a and 1L69

/Following is a translation of an article by Yu. V. Naydin in Byulleten' Tekhniko-Ekonomicheskoy Informatsii (Bulletin of Technical and Economic Information), No. 12, December 1959, pages 13-20./

The automatic lines 1L66, 1L67, 1L67a, and 1L69 for machining engine cylinder blocks, cylinder heads, and gear cases, designed by the Special Designing Bureau No. 1 of the Moscow City Sovnarkhoz, were produced in 1959 by the Moscow Machine-Tool Plant imeni Sergo Ordzhonikidze.

The machine tools in these lines are mainly of the aggregated type, and the majority of them consist of unified subassemblies. In all of the machine tools, the horizontal frames, fixtures, plate jigs, and spindle boxes constitute special subassemblies. The blanks move from machine tool to machine tool on bar conveyors.

Chips are carried from the machine tools by continuous belt conveyors driven by electric motors through reducing gears.

The power-head feed drive, the blank conveyor, and the positioning and clamping devices are all hydraulic. All the hydrosystems are fed by oil from special hydroinstallations.

The lines as a whole are controlled from central and operational panels. Certain machine tools and mechanisms have set-up panels.

Antifriction bearings, as well as all the friction surfaces in the subassemblies and fixtures, are lubricated by automatic pumps. The guideways on the beds are lubricated automatically upon movement of the power heads. Spindle-box mechanisms are lubricated by rotary pumps installed within the boxes.

Automatic line 1L66 is intended for the finish boring of cylinder block holes for the crankshaft, camshaft, and idler gear shaft, as well as for undercutting the faces of the middle main bearing and reaming four holes in the faces. In addition, the line turns the outside diameter and face of the camshaft bushing seat.

The automatic line (Fig. 1) consists of eight machine tools forming four independent units; each unit contains two machine tools and a quality-control fixture.

All of the fixtures in the line are of the tunnel type, and consist of pillars with roofs.

The block moves along the line with its base surface

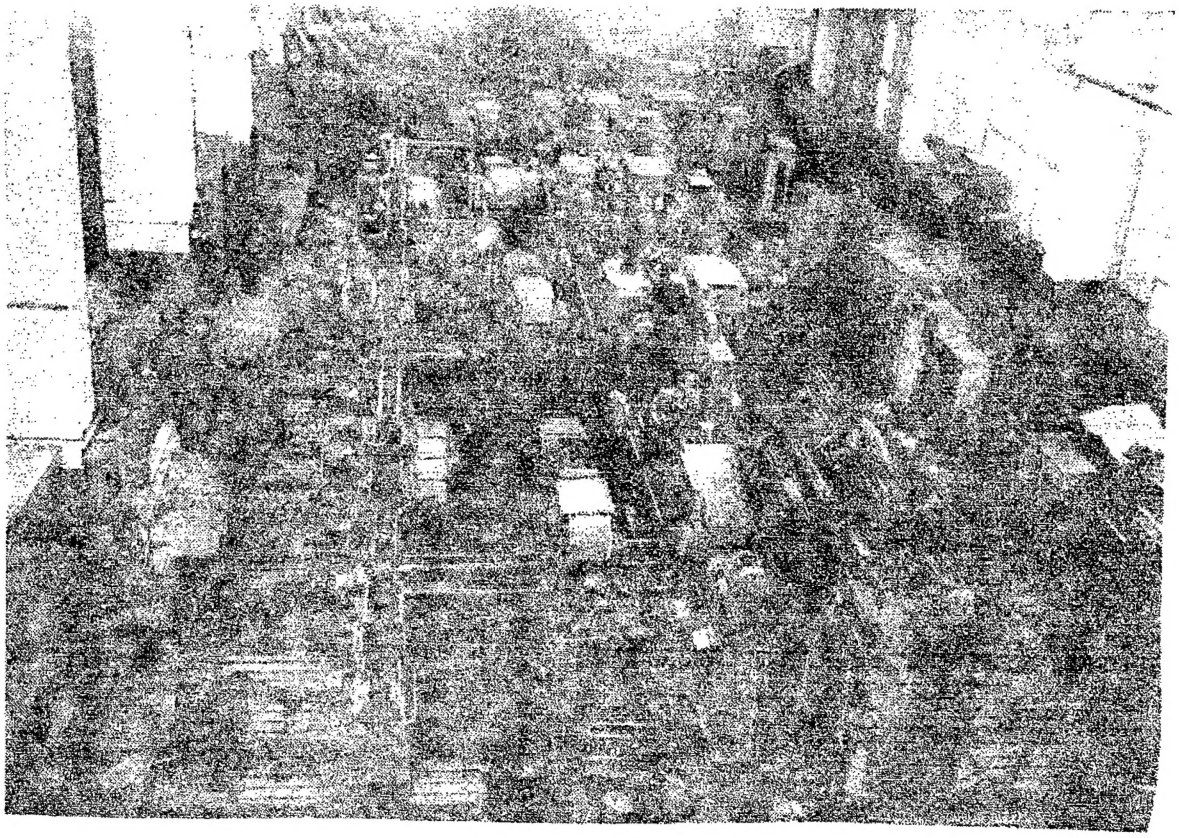


Fig. 1. Automatic line 1L66

up. In all of the fixtures, it is drawn up to the roof and installed on stationary locators.

In machine tool 1L66-S1 (the first machine tool in each unit), the block is immediately drawn up to the roof, and the power head can move forward.

In machine tool 1L66-S2 (the second machine tool in each unit) and in the quality-control fixture, the hoisting mechanism first lifts the block; this results in the insertion of arms for guiding the boring bars into the block. The boring bars are then inserted into the block, and only thereafter is the block raised another three millimeters and clamped. The roof of the fixture is equipped with spring ejectors for the purpose of removing the block from the locator.

The guiding of the tools into both the terminal and the intermediate fixtures is, in most cases, accomplished by means of revolving bushings mounted on antifriction bearings.

The tools for boring the idler gear-shaft hole and the camshaft hole are guided by sliding bearings. The reamers are guided by bushing jigs.

Inasmuch as the machine tools and quality-control fixtures are identical in all four units, any of these units may serve as a reserve and be taken out of operation. The machine tools of one unit are set up while the remaining three are in operation. With full loading of the line, three units begin operation simultaneously.

The auxiliary time on machine tool 1L66-S2 is 0.89 minutes and the rated productivity is 40 parts/hr. The loading of the line is set at 75 percent.

Each unit is connected on one side to a feeding conveyor, and on the other, to discharging conveyor. The line contains a total of 12 block conveyors: four--transverse; three--feeding; three--discharging; one--supplying; and one--delivery.

This number of conveyors ensures the simultaneous operation of all four units of the line, and, when necessary, permits one of the units to be adjusted without disturbing the work cycle of the remaining three.

Machine tools 1L66-02 /sic/ and the quality-control fixtures have mechanisms for hoisting and clamping the blocks in the fixtures. The hoisting and clamping take place separately and are accomplished by means of hydraulic cylinders. At the end of each of the units of the line is a device for inspecting the accuracy of holes bored for the crankshaft and camshaft. When dimensional rejects appear, the inspection device automatically disengages the corresponding unit without disturbing the operation of the other

units.

Automatic lines 1L67 and 1L67a are intended for machining engine cylinder heads.

Line 1L67 (Fig. 2) consists of 19 machine tools, or four sections. Each section has an independent system for the automatic clamping of cylinder heads as well as its own automatic cylinder-head transport, mechanically independent of the other sections.

The first section, consisting of four machine tools, machines two base holes, mills two ends, and drills and threads holes on the ends of cylinder heads. Prior to thread cutting, the holes are oiled by the automatic lubrication pumps.

The second section, consisting of six machine tools, performs drilling, beveling, and hole-threading operations on the side of the cylinder head.

The third and fourth sections, consisting of nine machine tools, machine all the holes in the upper and lower surfaces of the cylinder head.

At the end of the first section there is a turntable for rotating the part 90°. At the end of the second section, there is a drum which rotates the part around its horizontal axis; a storage unit for parts is located at the end of the third section.

Prior to threading all the holes in the fourth section, a shake-out apparatus with a vibrator removes chips from the deep holes in the cylinder heads being machined.

After leaving the 1L67 line, the cylinder head has an allowance of 1 mm on its lower surface, which is removed on a milling machine.

After going through the milling machine, the cylinder head moves on with finish machined surfaces to the 1L67a line (Fig. 3).

This line is composed of four machine tools which continue to machine the classed holes in the lower and upper surfaces, an installation for blowing chips out of the classed holes, and an inspection installation for checking the accuracy of the eight machined holes with a diameter of $20^{+0.023}$ and four recesses with a depth of $5^{+0.048}$.

Automatic line 1L69 (Fig. 4) is intended for the machining of 40 holes in the gearcase of the engine. Due to transportation difficulties, the case is machined on special trays. The case is located on the tray by two holes in its base, but lies freely without clamping.

The machine tools in the line have single-position fixtures. The trays are located in them by means of extensible fingers powered by hydraulic cylinders. The case being machined, together with its tray, is clamped by

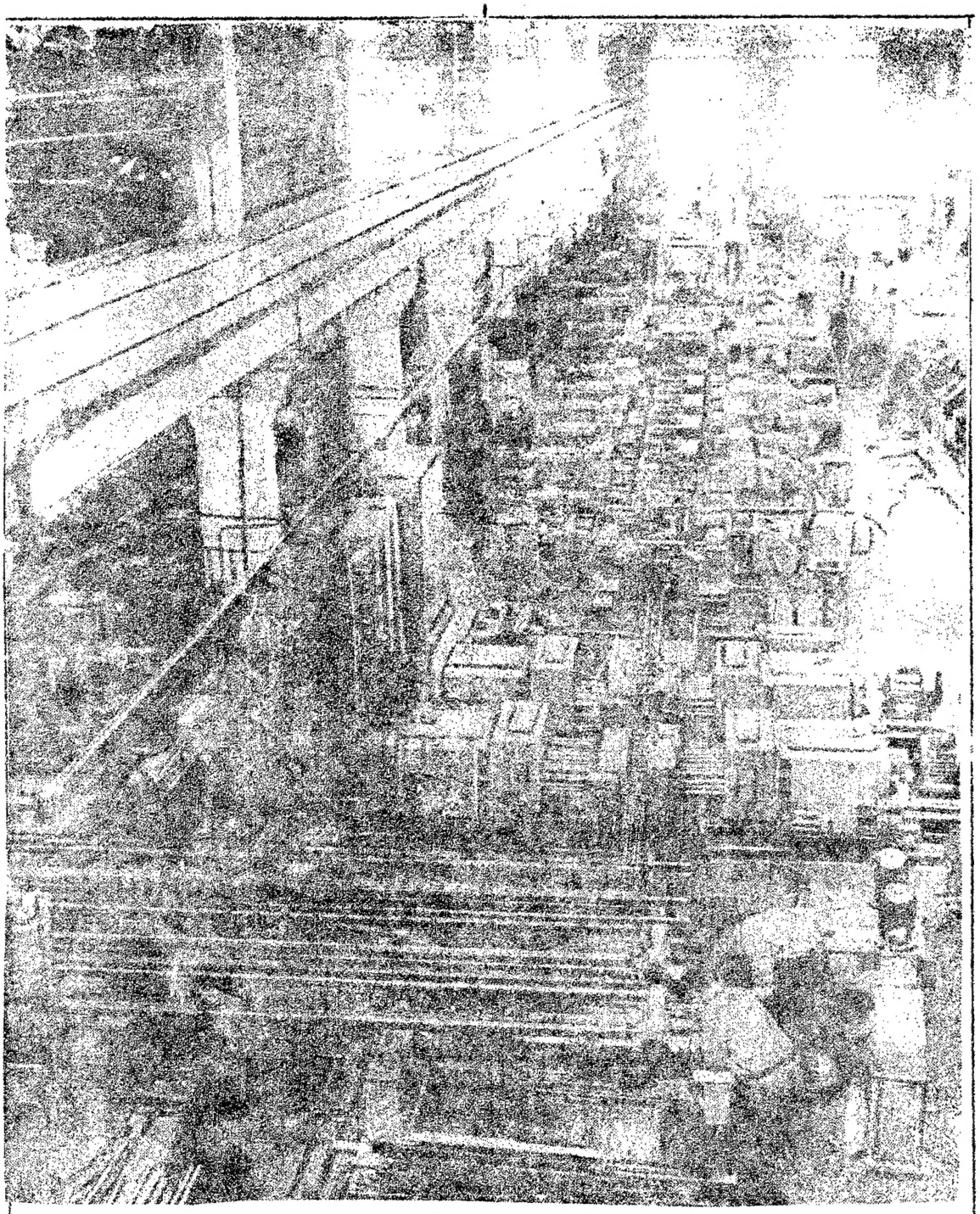


Fig. 2. Automatic line 1L67

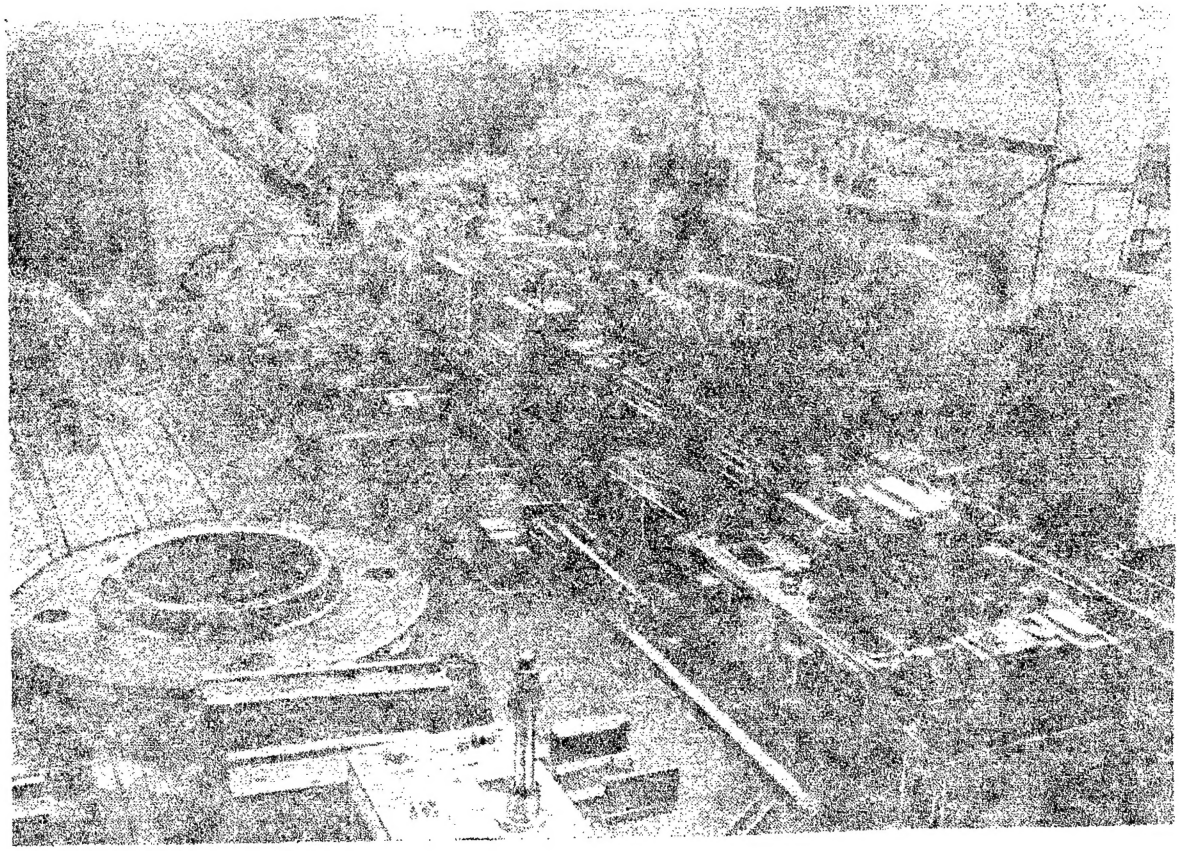


Fig. 3. Automatic line 1L67a

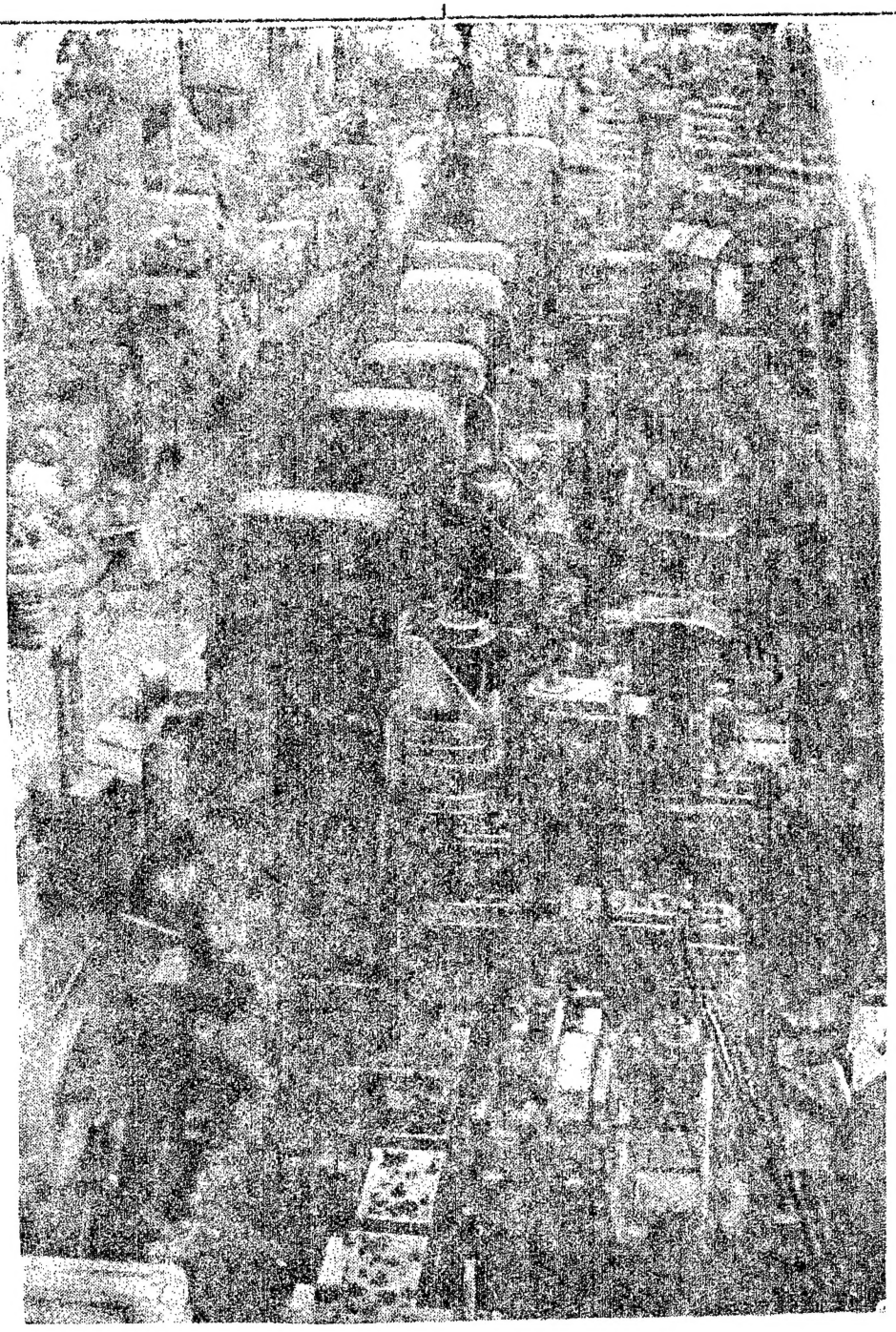


Fig. 4. Automatic line 1L69

hydraulic cylinders acting directly on the clamps without any kind of self-braking device. Clamping and unclamping are controlled with the aid of a hydraulic pressure relay.

Machining takes place in the line in two positions, with the case rotated 90° in the horizontal plane. For this purpose, the line contains a turntable, which divides the line into two sections.

In the 1L69 and 1L67 lines, the thread-cutting operation is preceded by a check on the presence and depth of the holes to be threaded by means of special feelers. Should any hole not be drilled through or far enough, the feeler rod frees a microswitch which gives a preliminary signal for stopping the line after completion of the work cylce by all power heads in all positions of the line.

Chips are removed from vertically located threaded holes in the 1L69 line, as in the 1L67 line, by means of a shake-out device. For this purpose, the machined part is turned 180° and shaken vigorously. The shaker is turned by a hydraulic cylinder, the piston rod of which pushes a gear rack engaged to a gear fastened to the shaker shaft.

The 1L67 and 1L69 lines are equipped for the automatic lubrication of thread-cutting tools.

The 1L66, 1L67, and 1L69 automatic lines are equipped with special measuring and inspection devices which check deviations in the dimensions of 1st and 2nd Precision Class holes in the parts.

Each inspection device in the 1L66 automatic line consists of a pneumatic-contact plug gage suspended on a hinge, which contains slots with protruding measuring contacts. The quality-control devices in the 1L67 and 1L69 automatic lines are contactless pneumatic plug gages. The depth of blind holes is measured by electrical contact indicators.

All the indicators are regulated by calibrating devices. Each measuring and inspection device gives the following signals:

(1) A signal that a part has been rejected on the basis of the upper or lower limits. In this case, the mechanisms of the section of the line in which the reject is observed are halted in their initial position; (2) A signal indicating a near-reject, i.e., a part that is not yet a complete reject but for which 0.9 of the established tolerance has been reached. In this case, two consecutive near-reject signals are required for stopping the line.

For the 1L67 and 1L69 lines, the signal panel carries a punched outline of the part being worked. The holes contain variously colored signal lamps. The color of a lamp or combination of lamps shows the nature of the reject.

Brief Technical Specifications of the Automatic Lines

Indicators	1L66	1L67	1L67a	1L69
Number of Items of basic equipment in the line:				
machine tools	8	19	4	8
power heads	12	37	6	12
spindles	32	412	30	84
Total electric-motor capacity, kwt	84	309	46	85.4
Weight, tons	79.5	210	45	70

Technico-Economic Indicators of the Automatic Lines

Indicators	1L66	1L67 & 1L67a	1L69
Number of production workers (persons)	5/16	12/36	4/14
Number of machine tools (units)	8/7	23/18	8/11
Production floor space, m^2	205/140	428/350	95/165
Annual output per 1 production worker (units)	33,000/10,300	13,750/ 4,600	41,250/ 11,800
Recoupment period (number of years)	3.1	2.1	

Note: The numerator refers to the automatic line; the denominator, to the aggregated machine tools /it replaces/. The comparison is made for a total annual production of 165,000 parts (hourly production--40 units).

In designing the automatic lines, the economic expediency of their manufacture was calculated. The advantages of automatic lines over aggregated machine tools may be seen from the accompanying table.

2. Model IZh-250 Compact Screw-Cutting Lathe

/Following is a translation of an article by L. S. Sidorov in Byulleten' Tekhniko-Ekonomicheskoy Informatsii (Bulletin of Technical and Economic Information), No. 12, December 1959, pages 21-22./

The Special Designing Bureau for machine-tool production of the Izhevsk Machine-building Plant has designed a compact screw-cutting lathe, model IZh-250 (see fig), which will serve as the basis for creating a series of other compact machine tools, such as the IZh-250T lathe, the IZh-250 OP operation lathe, the IZh-250R turret lathe, and the IZh-250G hydraulic equipped lathe. These compact machine tools will make it possible to replace a large stock of large machine tools and to free a substantial amount of production floor space.

The levers and the control panel of the machine tools are located in the operator's work zone. Speeds may be changed during operation (without stopping the machine). The support may be disengaged by either the turner's right or left hand; automatic stopping takes place in both the operations of turning and thread cutting.

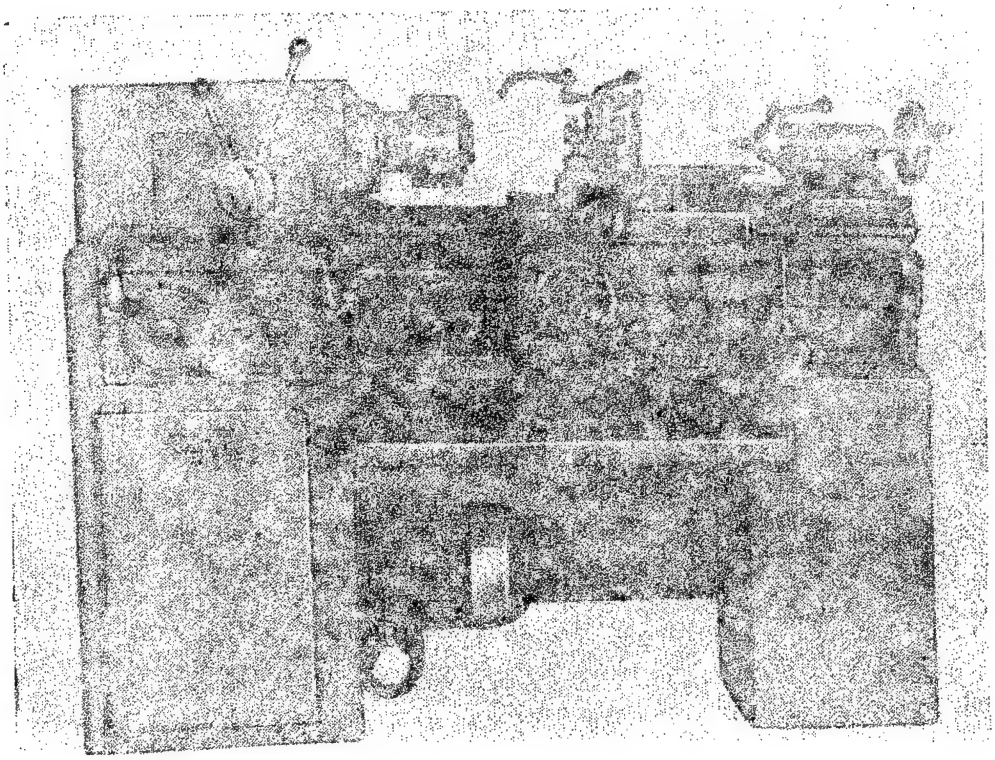
Technical Specifications of the Machine Tool

Maximum turning diameter	250 mm
Maximum working length	500 mm
Limits of revolutions per minute (24 speeds)	12.5--1.50 mm
Feed Limits per spindle revolution (16 feeds)	0.02--1.50 mm
Limits of metric threads machinable (pitch in mm)	0.15--6.00
Limits of inch threads machinable (no. of threads per inch)	3--20
Capacity of two-speed main-drive electric motor	2/2.5 kwt
Clearance dimensions (length x width x height)	1,590 x 645 x 1,290 mm
Weight	890 kg

The IZh-250 machine tool, which has been tested under laboratory and production conditions, is convenient to operate. A general-purpose machine tool, capable of doing a

good job of performing various screw-cutting lathe operations with an adequate degree of accuracy and a high level of productivity, it is simple in design and not difficult to manufacture.

The first series of IZh-250 machine tools [illegible] produced.



Model IZh-250 compact screw-cutting lathe

3. Model NR-5 Automatic Thread-Roller

/Following is a translation of an article by M. Ya. Kobylinskiy in Byulleten'Tekhnico-Ekonomicheskoy Informatsii (Bulletin of Technical and Economic Information), No. 12, December 1959, pages 24-26./

In 1958, Special Designing Bureau No. 3 designed, and the Novocherkassk Machine-tool Plant produced, the model NR-5 automatic thread-roller (see figure) for rolling set-screws (headless screws) with a pitch of up to 1.5 mm by the axial-feed method. Round thread-rolling rolls, with circular or single helical threading, serve as tools.

In addition to its basic function, when equipped with accessory fixtures and apparatus, the automatic thread-roller can be used for rolling screws with heads, as well as other parts with collars, by means of relieved thread-rolling rolls with multiple threading of the form of the thread. At the same time, it can be used for rolling long threads with a pitch of up to 1.5 mm and, with the use of smooth round rolls, for calibrating various cylindrical products: cylindrical pins and other similar parts.

A frame with a fixed support with two posts is installed on the bed (pedestal) of the automat. Crossarms are fastened on the ends of the posts, forming a quadrangle within which the rolling forces are encompassed. Thus, the bed is entirely relieved of the load.

Rotating heads are installed on the fixed support and on the right crossarm, with spindles driven by vertical Cardan shafts from the gear box.

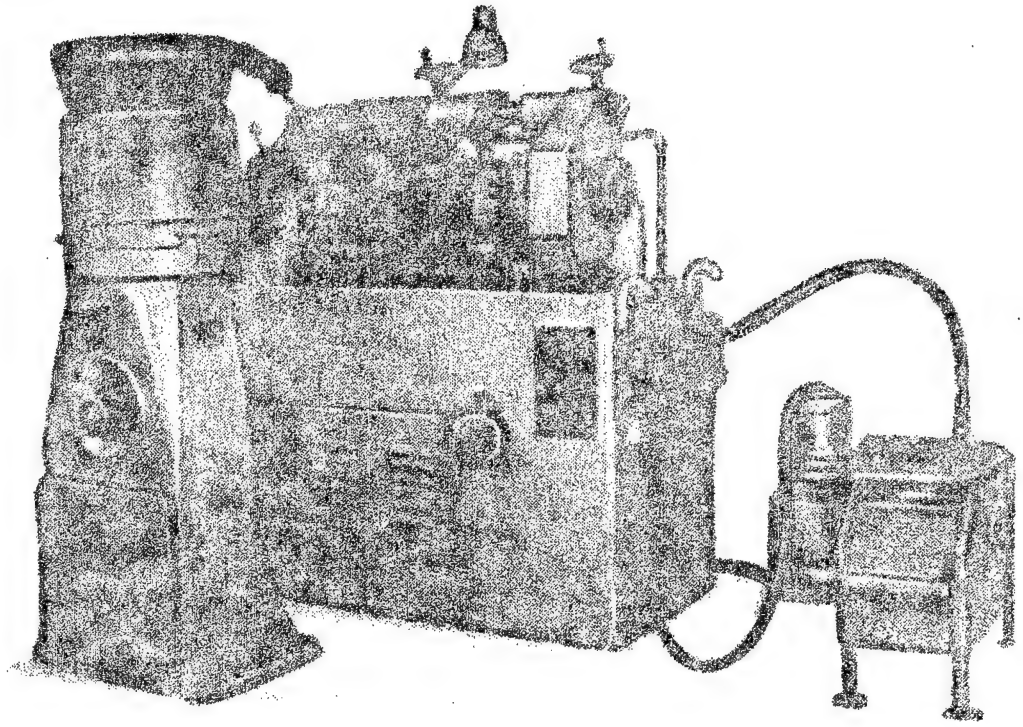
The axes of the spindles are rotated to the required angle (the product's screw-line pitch angle) with the aid of hand wheels.

The front bearings of the spindles have special needle bearings permitting heavy loads, while standard bearings with cylindrical rollers serve as the rear bearings.

Both spindle heads are fixed, during rolling; this has considerably simplified the design of the machine, in contrast to thread-rolling machines with parallel spindle axes, in which one spindle head is withdrawn with the aid of a hydraulic or mechanical drive.

In the setting-up operation, the thread-rolling rolls are positioned at the proper distance by moving the right spindle head.

The blanks are automatically brought to the rolling



Model NR-5 automatic thread-roller

area by an electro-magnetic vibrating bunker through a feeder tube, one end of which is rigidly connected with the bunker bowl chute, while the other leads to the ends of the thread-rolling rolls.

The blanks, which are oriented in the bowl of the vibro-bunker, move into the feeder tube and are sent in a continuous flow to the rolling area.

Under the pressure of the weight of the column of blanks and the vibrational force resulting from the vibration of the feeder, the blanks are pressed against the thread-rolling rolls and grasped by their forward portions.

The rolled screws move through a carry-off chute to a storage box located on the rear wall of the bed.

The vibrating bunker is a separate mechanism situated alongside the machine tool.

The automat is equipped with a magnetic separator for cleaning the cooling fluid (oil) of metal waste (chips), which peels off the blanks in rolling and has a harmful effect on the durability of the working tool.

Technical Specifications of the Automat

Diameter of rolled product: maximum and minimum	10 & 4 mm
Pitch of rolled threads	1.5 mm
Rolling force	5,000 kg
Spindle axes inclination angle	0-6°
Diameter of rolls	from 110-to 140 mm
Spindle rpm range (6 stages)	20-200
Capacity of main-drive electric motor	2.8 kwt
Clearance dimensions (length x width x height):	
Without magnetic separator	1,200 x1,500 x 1,500 mm
With magnetic separator	1,700 x1,500 x 1,500 mm
Weight	1,790 kg
Productivity of the automat (depending on the length of the product and the pitch of rolled threads)	1,800-7,500 screws/hr

The rolling of headless screws and long threads is considerably more economical with the use of thread-rolling rolls with circular or single helicel threading on machine tools of the NR-5 type having nonparallel spindle axes than with the use of thread-rolling rolls with multiple threading on machine tools having parallel spindle axes.

Thread-rolling rolls with circular threading of the

form of the thread have the following advantages: (1) They allow for repeated resharpening; they may be utilized until completely worn out, since their diameter does not depend on the diameter of the rolled product. (2) They are considerably simpler to produce than rolls with multiple threading of the form of the thread. (3) The width of rolls with circular threading does not depend on the length of the rolled thread; consequently, products of various lengths may be rolled with one set of rolls, which wear evenly throughout their width. (4) Threads of various diameters with the same pitch may be rolled with the same set of rolls. (5) The possibility of repeated sharpening of the rolls (until entirely worn out) makes for a considerably smaller expenditure of tool steel than the use of rolls with multiple threading. (6) There is no necessity to withdraw a movable spindle head; consequently, the machine tool works more smoothly.

According to data of the Novocherkassk Machine-Tool Plant, the annual savings from the employment of one automat with a two-shift operation and a 0.85 utilization coefficient amounts to 140 thousand rubles.

4. Model NR-10 Automat for Rolling Threads on Taps

/Following is a translation of an article by S. B. Vaynshteyn in Byulleten' Tekhniko-Ekonomicheskoy Informatsii (Bulletin of Technical and Economic Information), No. 12, December 1959, pages 26-28./

The model NR-10 automatic thread-rolling machine for rolling threads on taps, designed by Special Designing Bureau No. 3 of the Odessa Sovnarkhoz, was produced by the Novocherkassk Machine-Tool Plant in 1959.

The rolling of threads on the machine is accomplished by two thread-rolling rolls, one of which undergoes a radial feed during the process of rolling.

The machine has a stationary head and a movable head (see figure). The stationary head is rigidly fastened to the upper surface of the bed, and the movable head moves along the bed's guideways by means of two hydraulic cylinders fastened to the support. The spindles of the thread-rolling rolls, which are mounted in the heads, are mutually positioned in an axial direction.

The spindles are driven by an electric motor through reducing gears mounted on the rear wall of the bed.

A fixture--a supporting blade serving as a bearing for the product during the process of rolling--is installed on the upper surface of the bed, between the stationary and movable heads.

The support with its cylinders and the stationary head are fastened by a round tie rod and a channel-iron cross-arm, forming a rigid system with the bed which contains the rolling forces.

The cooling fluid--sulfofrezol or machine oil--is fed to the rolling area by a pump installed on the rear wall of the bed.

The machine has a loading device--a vibrating bunker. The bowl of the bunker is vibrated by an electromagnet. A device for aligning the blanks in a prescribed position is fastened at the exit of the bunker.

The machine's automatic cycle is achieved by a control mechanism mounted on the rear end of the spindle of the stationary head. The regulating cam is rotated by the spindle through two replaceable gears and a friction clutch. Through its rotation, the cam controls a four-position valve, which transmits commands to the movable head's reversing valve. The full work cycle of the machine tool takes place with one revolution of the cam--advance of the head,

thread rolling, thread calibrating, retreat of the head, and transfer of the next blank to the rolling area.

The machine tool operates in the following manner: Blanks spilled into the vibro-bunker bowl are lifted up through a spiral and move into the aligning device. Here the blanks are sent tail-first through a chute to a feeder coil. A feeder segment driven by a hydraulic cylinder is freely mounted on the spindle of the stationary head. When the segment is located in the loading zone, a springed dog is retracted and the next blank falls freely from the coil into the segment.

When the segment moves to the rolling zone, the tail of the tap blank is clamped between the dog and a tooth on the segment. The blank is carried to the supporting blade in this position. The succeeding blank in the coil is cut off by the outer surface of the segment. After the rolling rolls seize the blank, the segment receives a command to return to its initial position to be loaded with the next blank.

Upon completion of thread rolling and calibrating, the movable head is retracted to its initial position, and the finished product moves from the supporting blade to a vibrating chute, by which it is carried away to a receptacle.

In addition to the automatic work cycle, the machine tool has set-up and semiautomatic cycles. The desired cycle in the machine tool is obtained by switching a control valve on the hydraulic panel.

The semiautomatic cycle is used for rolling nut taps with a length of over 135 mm.

The machine's hydraulic system works from a hydraulic installation mounted on rollers in a recess in the bed's side.

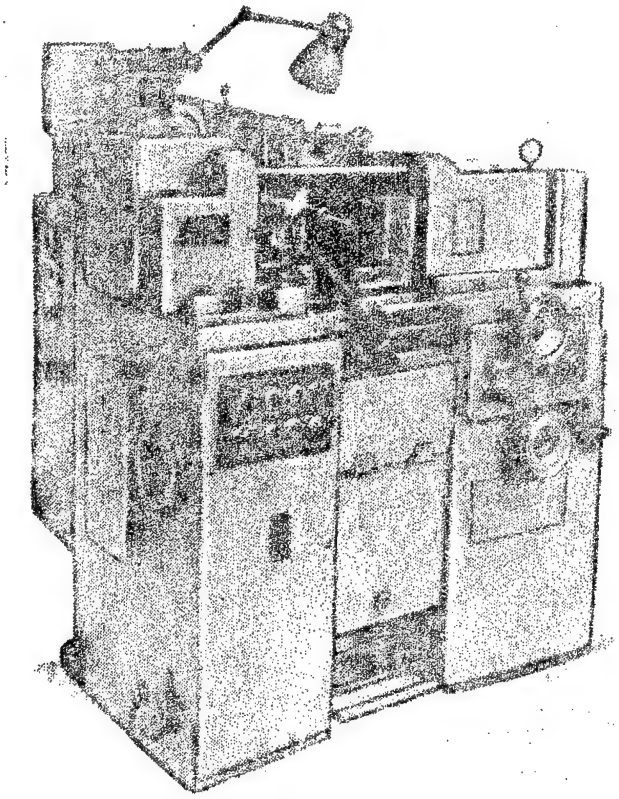
The speed of the motion of the movable head is regulated by a throttle on the control panel.

The required rolling force, which depends on the diameter and pitch of the thread to be rolled, is regulated by a pressure valve. The pressure in the system (up to 45 kg/cm^2) is controlled by a manometer.

The machine's electrical apparatus is mounted in a cabinet on the front of the bed. The electrical apparatus of the vibro-bunker is located in its pedestal.

Technical Specifications of the Automat

Maximum rolling force	10,000 kg
Range of diameters of rolled threads:	
with automatic loading	7-20 mm
without automatic loading	to 60 mm
Maximum pitch of rolled thread	3 mm
Working travel of movable head	10 mm



Model NR-10 automatic thread-rolling machine

Maximum diameter of rolls	170 mm
Maximum length of rolling:	
with automatic loading	50 mm
without automatic loading	120 mm
Range of spindle rpm (4 steps)	26-100
Capacity of main electric motor	4.5 kwt
Productivity in rolling:	
M20 taps	1,000/hr
M8 taps	1,700/hr
Clearance dimensions (with loading mechanism) (Length x Width x Height)	1,255 x 1,735 x 1,510 mm
Weight	2,600 kg

In addition to its basic purpose, the automat may also be used for rolling fastener threads and other threads on a variety of parts, including bolts, studs, etc. The automat can be built into an automatic line.

5. The PGS-30 Industrial Loudspeaker Communications System for Metallurgical Plants

/Following is a translation of an article by A. I. Mirkin in Byulleten' Tekhnico-Ekonomicheskoy Informatsii (Bulletin of Technical and Economic Information), No. 12, December 1959, pages 28-29./

In 1957, the Leningrad Telephone Plant developed the apparatus for the PGS-30 industrial loudspeaker communications system with selective calling and a capacity of up to 30 subscribers for a metallurgical plant being constructed in India; the plant in India was furnished five sets of this apparatus.

The PGS-30 system is designed for organizing simple selective loudspeaker communications among work posts (from two to 30, inclusive) related on the basis of technological process. The system has two separate amplifiers -- for reception and transmission -- which are alternately connected with a two-cable line of a general or special telephone network.

The system works on the "speak--listen" principle; that is, the amplifiers are switched on alternately either for sending or receiving.

The amplifiers are operated by remote control. The operator presses the key for the selected subscriber on his own panel and switches his amplifier to sending, while the amplifier of the subscriber being called is blocked for receiving. The system anticipates selective calling by voice after the proper key on the subscriber's panel has been pressed. A relay cabinet is included for commutation and control of the system.

The PGS-30 apparatus makes it possible to organize group communications, and over-all circular transmission of commands; it ensures the reliable transmission of commands and information, with a noise level at the sending location of 90 decibels. Using a microphone of the DEMSh-1 type, it is possible to transmit commands with a noise level of up to 100 decibels.

The PGS-30 apparatus ensures reliable reception of commands or messages within a radius of up to five meters at a noise level of as high as 90 decibels at the reception location, and within a radius of one meter at a noise level of 100 decibels. The resistance in the two-cable subscriber's line from the subscriber's panel to the cabinet location is 200 ohms.

The apparatus is designed for the following types of power supply: the relay circuits and the signal circuits--from a 220-v alternating-current network through a 24-v feeder block; the amplifying apparatus--from a 220-v alternating-current network.

The apparatus of the PGS-30 system operates reliably at surrounding atmosphere temperatures of from +4 to +48°, and at a relative humidity of 98 ± 2 percent.

The PGS-30 apparatus set includes the relay cabinet, the feeder block, up to 30 table-model or recessed subscriber panels, with various capacities of from five to 30 subscribers, and up to 30 amplifying devices. The apparatus was developed and produced in a tropical version. At the present time, this system is being remodeled for Soviet conditions.

6. The DK-50Zh Expander-Compressor and the DVD-9 High Pressure Expander

/Following is a translation of an article by V. L. Dmitriyev in Byulleten' Tekhnico-Ekonomicheskoi Informatsii (Bulletin of Technical and Economic Information), No. 12, December 1959, pages 29-32./

On the basis of the main parts of the DK-50 expander-compressor, which services installations for producing liquid oxygen and is used in the systems of the AK-12 and AK-12M mobile oxygen-producing stations, the All-Union Scientific Research Institute for Oxygen Machine Building (VNIIKIMASh) has designed two new types of machines for the needs of industry: the DK-50Zh expander-compressor and the DVD-9 high-pressure expander. In 1958 the Urals Compressor Plant began the serial production of these machines.

The DK-50Zh expander-compressor (Fig. 1) is designed to obtain air at a low temperature. The energy from expanding air is expended in the compressor portion on the partial compression of air intended for the pressure charging of the high-pressure compressor. The compressor is equipped with the ZhKDZ-1 and ZhKDZ-2 installations for reverse condensation; it differs from the DK-50 expander-compressor by virtue of its increased productivity, the installation of electric oil-warming cartridges 1 in the crankcase 2, the reduced number (six pairs) of compression rings in the piston set 3, and the installation of an intermediate union 4 between the cylinder head 5 and the savety valve 6.

There has been an increase in productivity as a result of a reduction in the pressure of the air as it leaves the expander. The electric heaters are mounted on the lower portion of the crankcase for the operation of the machine in the winter; when the temperature of the oil reaches 25-35°, the heaters should be switched off. The intermediate union 4 was added to prevent freezing of the safety valve. The expander piston 7 is rigidly fastened to the head of the compressor piston 8.

The DK-50Zh expander-compressor is a machine which combines an expander and a compressor into one aggregate. The machine has no external mechanical connections (coupling with a motor or with an external consumer).

The DK-50Zh is designed in the form of a vertical tandem machine. In order to reduce mechanical losses from friction, the drive mechanism of the machine is mounted on antifriction bearings. To guard against racing, the expander-

compressor is equipped with a safety governor. The safety valve gives way at 230 exc. atm. The safety membrane on the output pipe ruptures at 2-2.5 exc. atm.

Technical Specifications of the DK-50 Zh

Productivity of the expander	85 ± 5 m^3/hr
Air pressure at input	200 atm
Air pressure at output	to 1 atm
Temperature of air after expander (with a temperature before the expander of +10° to +15°)	-100°
Compressor feeding pressure	0.3-0.4 atm
RPM of the machine	370-400
Clearance dimensions (length x width x height)	900 x 590 x 1,230 mm
Weight of expander-compressor	380 kg

The DVD-9 high-pressure expander, a high-speed vertical piston machine of the cross-head type (Fig. 2) was also developed from the DK-50 expander-compressor, employing its drive mechanism and a majority of its parts and subassemblies.

The frame of the DVD-9 expander, taken entirely from the DK-50 expander-compressor, is composed of two parts: the crankcase 1, the lower portion of which serves as an oil reservoir, and the middle member 2, in which are located the guideways for the crosshead 3. A support fastened to the outside of the middle member carries the drive gears, the governor cams, and other parts of the distribution mechanism. The carrying surface of the crosshead is poured with Babbitt metal. The upper head of the connecting rod 4 is joined to the crosshead with the aid of apin 5, which is supported by two conical roller bearings 6. The assembly which connects the crosshead to the piston 7 is self-aligning. The piston packing in the DVD-9 expander consists of seven sets of double piston rings 8.

The expander cylinder 9 has a removable head, containing the spindle-type intake valve 10 and exhause valve 11, which are the most important parts of the expander. Lubrication of the DVD-9 expander is accomplished by splash in the case of the drive mechanism, by a mechanical lubricator for the cylinder and piston, and by a grease gun for the intake valves and distribution levers. The antifriction bearings in the crosshead are lubricated by grease from a grease-gun.

Technical Specifications of the DVD-9 Expander

Productivity of the expander	120 ± 5 m^3/hr
Air pressure at intake	200 atm
Air pressure at exhaust	6 atm
Temperature of air after expander (with a temperature before the expander of $+20^{\circ}$)	-115°
Revolutions per minute	325
Efficiency of the expander	Not under 65%
Over-all weight of the expander	465 kg

The braking of the DVD-9 expander is accomplished by a short-circuited 220/380-volt asynchronous electric motor of the AL-52-6 type (version Sh2); the rating of the electric motor is 4.5 kwt, rpm--1,000, drive--V-belt.

The safety device of the expander consists of a centrifugal governor acting through a pull rod and yoke on the exhaust valve at 370 ± 10 rpm. The DVD-9 high-pressure expander is equipped with a productivity governor, which makes it possible to regulate productivity in a range of $\pm$ 20%.

7. The "Leningradets" Self-Propelled Hydraulic Crane Type KGL-1

/Following is a translation of an article by N. V. Rodenkov in Byulletin' Tekhniko-Edonomicheskoi Informatsii (Bulletin of Technical and Economic Information), No. 12, December 1959, pages 39-40./

The "Leningradets" crane is a self-propelled hoisting and conveying machine with a five-ton hoisting capacity designed for loading and unloading various heavy and lengthy freights at open storage facilities, factory yards, and construction sites. The design of the crane was developed by the designing bureau of a metal-working plant of the Leningrad Sovnarkhoz's Heavy Machine-building Administration.

All the mechanisms of the crane are mounted on its own base, which employs certain subassemblies of the ZIL-150 truck. The following are the basic elements of the crane (see figure): the frame with a supporting column for the chassis of the crane; the drive shaft; the rear steering wheels; the ZIL-150 engine with transmission and power take-off for the hydraulic drive; the control levers with hydraulically-boosted steering; and the hydraulic system.

The hook is lifted and lowered by means of a hydraulic cylinder.

To assure the longitudinal stability of the crane while moving with a load, counterweights in the form of fenders a rear bumper were installed. The steering of the crane is accomplished with the assistance of a hydraulic booster, which reduces the steering force to 2-3 kg. The controls of the moving portion of the crane are analogous to those of the ZIL-150 truck. The crane-mechanism controls consist of two levers from the slide-valve distributor, located on the instrument panel in the driver-operator's cab.

The advantages of the "Leningradets" crane, as compared to the KL-3 type crane produced by the plant, are as follows: 1) all operations (hoisting and lowering the freight, running out the boom) are hydraulic; 2) the drum hoist is replaced by hydraulic cylinders and a tackle-block system, ensuring simple operation and smooth hoisting and lowering of freights; 3) changing the overhang of the boom is carried out by means of a hydraulic cylinder instead of a rigid bar.

Technical Specifications of the Crane

Hoisting capacity:	
with boom run out 1.2 m	5 tons
with boom run out 3.7 m	1.6 tons
Maximum height of hook	4.8 m
Hoisting speed	0.12-0.15 m/sec
Time for changing boom overhang from minimum to maximum	15 sec
Traveling speed of the crane:	
with freight	3.5-6 km/hr
without freight	10-15 km/hr
Engine	Model ZIL-150

...

Clearance dimensions of the crane:	
width	2,290 mm
length with boom in traveling position	1,730 mm
height	3,300 mm
Weight	6,700 kg

8. F13 Photocompensation Comparator

/Following is the translation of an article by S. M. Sokolovskiy in Byulleten' Tekhniko-Ekonomicheskoy Informatsii (Bulletin of Technical-Economic Information), No. 12, December 1959, Moscow, pages 35-36./

The "Vibrator" Plant in Leningrad has built a new electric measuring instrument -- the F13 photocompensation comparator (see photo). This instrument, when in complete set with R118 and R118/1 range and I502 current instrument transformer, can be used to measure voltage, wattage and amperage of alternating current by means of d-c potentiometers. The comparator can also be used to measure the same parameters for direct current.

The instrument described here consists of a coupled measuring mechanism, an optical system and a photoresistor.

The principle of performance of the comparator is based on the comparison of two mechanical moments one of which is created by the measured alternating current, voltage or wattage in an electrodynamic system, and the other -- by direct current in the magnetoelectric system.

The angle of turn of the consolidated movable part is a function of the difference in the compared moments; when these moments equal one another, the magnitude of alternating current (or voltage or wattage) is determined according to the magnitude of direct current. Consequently, the measurement of alternating current is reduced to measuring the direct current, which is precisely measured by means of d-c potentiometers.

The comparator is powered by an a-c system with a frequency of 50 cps and a voltage of 127±10 percent volts or 220±10 percent volts and from a storage battery with a voltage of 5.4-6.6 volts and a capacity of not less than 70 ampere-hours. It can also be powered from a ferroresonant voltage stabilizer.

The accuracy of the F13 comparator is not less than ±0.02 percent when measuring the magnitude of direct or alternating current with frequency of from 45 to 55 cps within the limits of from 30 to 100 milli-amperes, not less than ±0.05 percent when measuring the voltage of direct or alternating current with frequency of from 45 to 55 cps, and not less than ±0.1 percent when measuring the wattage of alternating current with frequency of from 45 to 55 cps and when cos = 0.8-1.0.

The comparator, in a complete set with the R118 and R118/1 range multipliers and with the I502 current transformers, has the following limits of measurement: current -- 0.05-0.1-0.2-0.5-1-2-5-10-20-50 amperes; voltage -- 15 to 600 volts; wattage -- 0.75 watts to 30 kilowatts according to rated current and voltage. At direct connection the limits of measurement are: for current -- 100 milli-amperes, for voltage -- 1.5 volts.

The resistance of the comparator proper is 15 ohms. Current consumed by the comparator amounts to 100 milli-amperes.

Time of damping of the comparator: ≈ one second.

Test voltage between all current-conducting parts and the body, and between the amplifier and feeding circuits: two kilovolts.

Total weight of the comparator: 14 kg.

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